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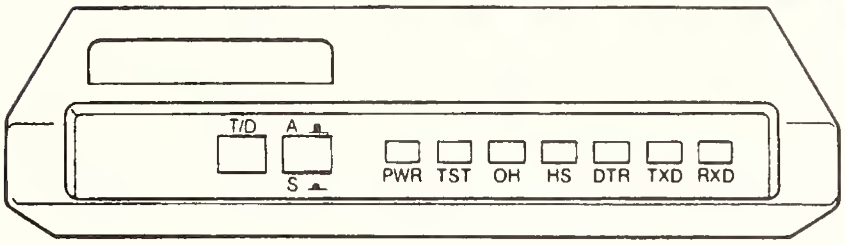
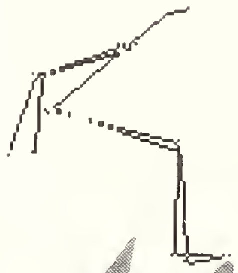
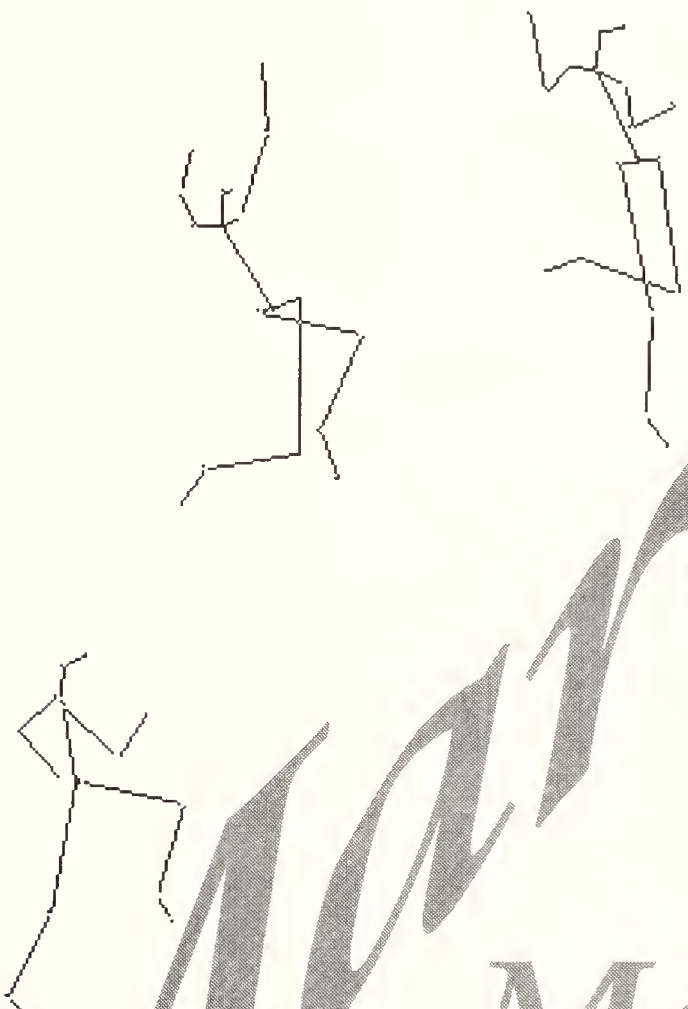
UTCS Computer News

Modems



Models





March

Maple

$$\frac{\left[\left[\frac{q}{2}-\frac{ni}{q}\right]^2-1\right]\ln\left(\frac{\frac{ni}{q}-1-\frac{q}{2}}{\frac{ni}{q}+1-\frac{q}{2}}\right)}{2q}$$

ISSN 0315-4661 March 1992 No. 276

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Publisher
University of Toronto Computing Services
Toronto, Ontario
Canada M5S 1C1

Editor: Patricia Hood

Editorial Assistant: Maureen Monné

Publication Date: *March 1, 1992*

Subscriptions
Subscriptions run for one year, beginning each January. Changes should be entered on the form at the back of this issue and mailed to: *ComputerNews*, 4 Bancroft Avenue, Room 217 (or phone 416-978-4034). FAX: (416)978-7159.

ComputerNews is published eight times yearly by the University of Toronto Computing Services (UTCS). Enquiries should be directed to:

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Acknowledgements
Thanks to Amanda Wagner for her assistance in editing this issue.

This newsletter was entirely produced on a Macintosh using PageMaker and other related Macintosh software.

Models

Software to Explore Mathematical Modelling

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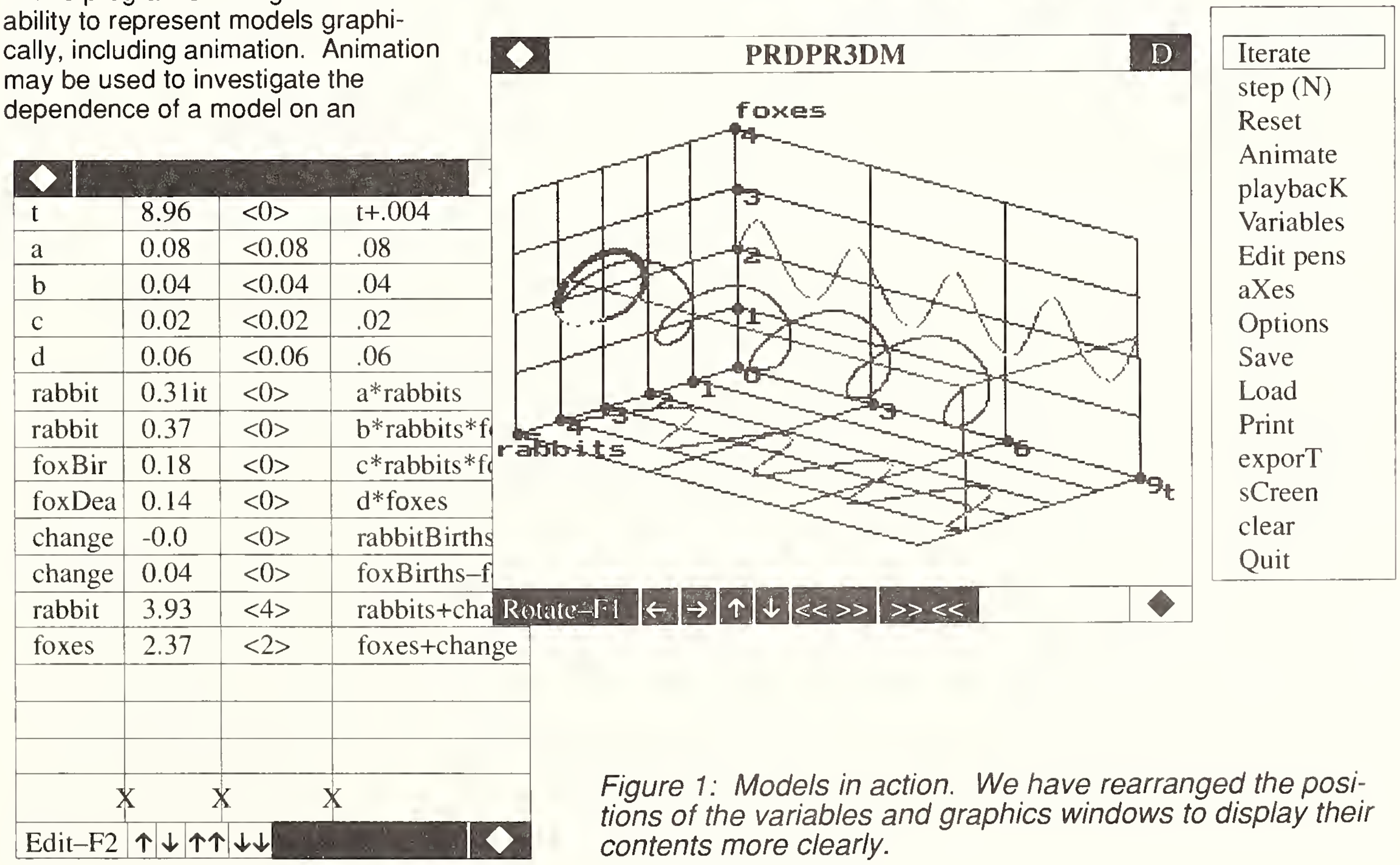
In the May/June 1990 issue of *ComputerNews* I reviewed two interesting educational programs from Lascaux Graphics, f(z) and Fields&Operators. Recently the same company released a new program, **Models**, for investigating differential equations, difference equations, dynamical systems, and general mathematical models. Like the programs previously reviewed, Models is of an educational/exploratory nature. It may be very useful for people who want to develop a better appreciation for mathematical modelling. Also, it may be used to create and investigate relatively simple models of various phenomena.

The program's strength lies in its ability to represent models graphically, including animation. Animation may be used to investigate the dependence of a model on an additional variable, or to rotate three-dimensional (3D) objects in space for better visualization.

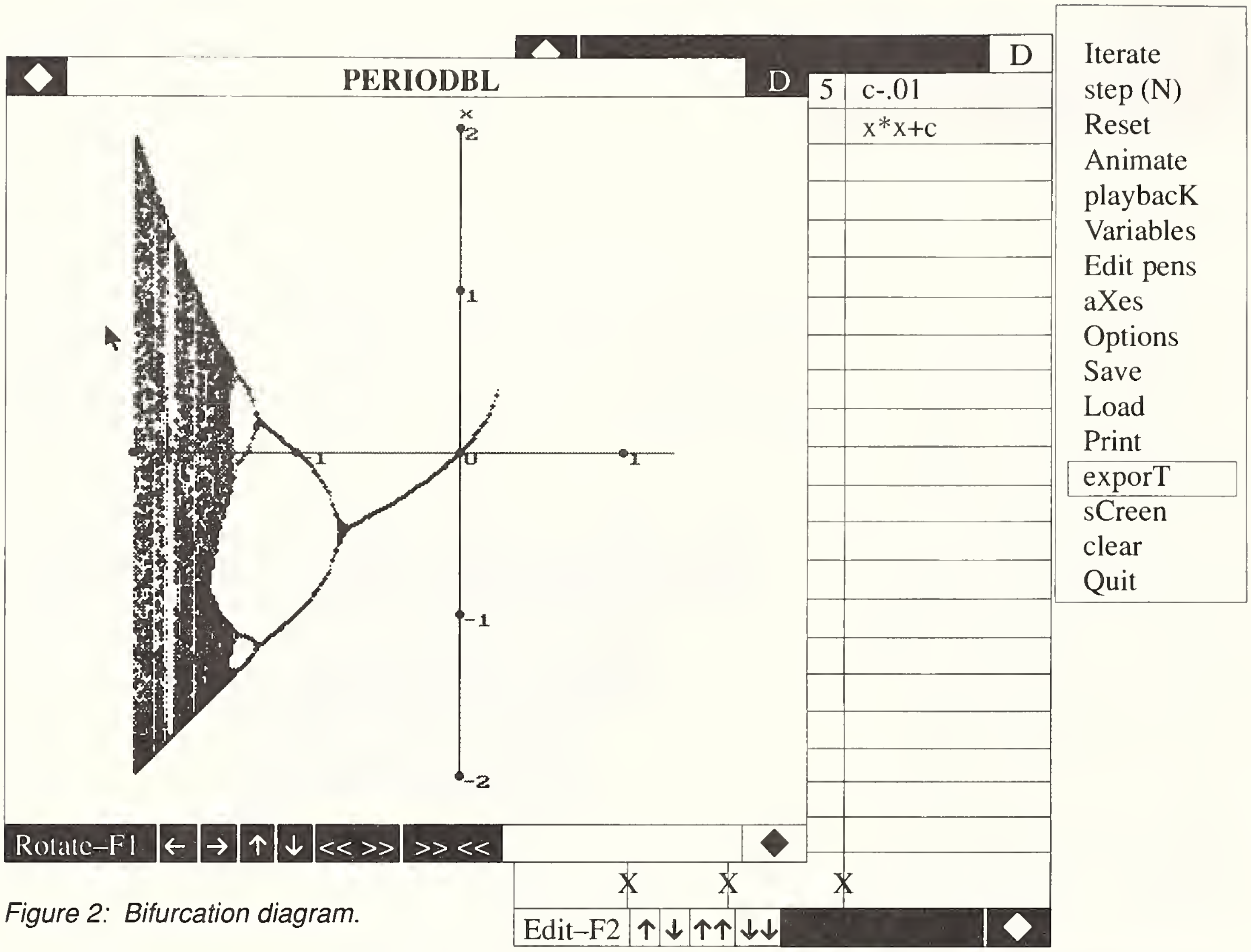
The program is designed to run with a mouse, but it can also be run from the keyboard.

Figure 1 shows Models in action. Of the three windows you see, the right-most one is the menu window. The meaning of the items it contains will be discussed on the next page. In the centre you see the graphics



t	8.96	<0>	t+.004
a	0.08	<0.08	.08
b	0.04	<0.04	.04
c	0.02	<0.02	.02
d	0.06	<0.06	.06
rabbit	0.31it	<0>	a*rabbits
rabbit	0.37	<0>	b*rabbits*f
foxBir	0.18	<0>	c*rabbits*f
foxDea	0.14	<0>	d*foxes
change	-0.0	<0>	rabbitBirths
change	0.04	<0>	foxBirths–f
rabbit	3.93	<4>	rabbits+cha
foxes	2.37	<2>	foxes+change

Figure 1: Models in action. We have rearranged the positions of the variables and graphics windows to display their contents more clearly.



5 c-.01
x*x+c

Figure 2: Bifurcation diagram.

window and to the left the variables window. You can move around and resize the graphics and variables windows. You can scroll the variables table up and down and edit its contents. You can also change the width of the columns. The graph in the graphics window can be moved in any direction, zoomed in and out, and also rotated (if it is a 3D object).

In the example shown on the previous page, the program demonstrates a well-known predator-prey model. The graph shows the change in the numbers of foxes and rabbits with time. The projection of this curve on the x-z plane gives the phase portrait; the projection on the y-z plane shows the change in the number of foxes with time; and the x-y plane illustrates the change in the number of rabbits with time. You can choose to draw various lines on the graph in different colours (which, of course, we cannot illustrate here).

The items in the menu window perform the following functions:

Iterate – iterates the model until you stop the program (by pressing any key or clicking a mouse button);
step (N) – performs N iterations, where N can be set by the user;
Reset – resets the variables to their initial values (given in the third column of the variables table);
Animate – is used to create an animation. In this case the program creates a series of graphs, which are written to a disk file (see below);
playbacK – replays in rapid succession a series of graphs created by the Animation command (see above);
Variables – invokes the editor for the variables table (the same can be achieved by pressing the F2 function key or clicking on the Edit bar at the bottom of the window). To create a model you can use arithmetic operators (+,-,*,/,^), a number of elementary functions (abs, trigonometric and hyperbolic functions, exp, log), and several additional functions like random number generator,

sign and step functions, and two mod functions (returning arguments mod 1 and mod 2 pi);
Edit pens – is used to specify how the graph is drawn (which variables, with what colour, line thickness, and so on);
aXes – is used to determine how the axes are drawn;
Options – allows you to set such things as N (number of iteration steps), zoom factor, default data file, scroll increment, and rotation increment;
Save – is used to save a model;
Load – is used to load a previously saved model;
Print – allows you to print the screen on a Hewlett-Packard LaserJet or Epson-compatible printer;
exporT – allows you to generate a text (ASCII) file from the contents of the variables table;
sCreen – is used to specify the graphics card used (VGA, EGA, CGA, or Hercules), the screen aspect (to make sure that a circle comes out as a circle and not an ellipse), and the screen background colour;
clear – clears the windows;
Quit – quits the program.

You can activate the menu functions either by pointing and clicking with the mouse to select what you want, or by pressing on the keyboard the letter that you see capitalized in the command. (The clear command is the exception. You must use the menu to issue this command.)

Models is supplied with a number of example files which illustrate its various capabilities. *Figures 2* and *3* show other types of graphs which the program can create. *Figure 2* is a bifurcation diagram. *Figure 3* illustrates the program's ability to present data from an external file graphically. In the case shown, the data was generated by digitizing a sequence of still frames of a jumping athlete to produce a "stick figure" model. Models animates this sequence to show you the dynamics of a jump.

Although a lack of conditional constructs limits the types of models which can be constructed, the availability of step functions allows you to remedy this deficiency to some extent.

In summary, I find Models to be a nice product which will appeal to many people entering the field of mathematical modelling. Its user friendliness and ease of operation are similar to the other products from Lascaux Graphics. Models comes with a well-written manual, which also provides ample references to more advanced literature on modelling.

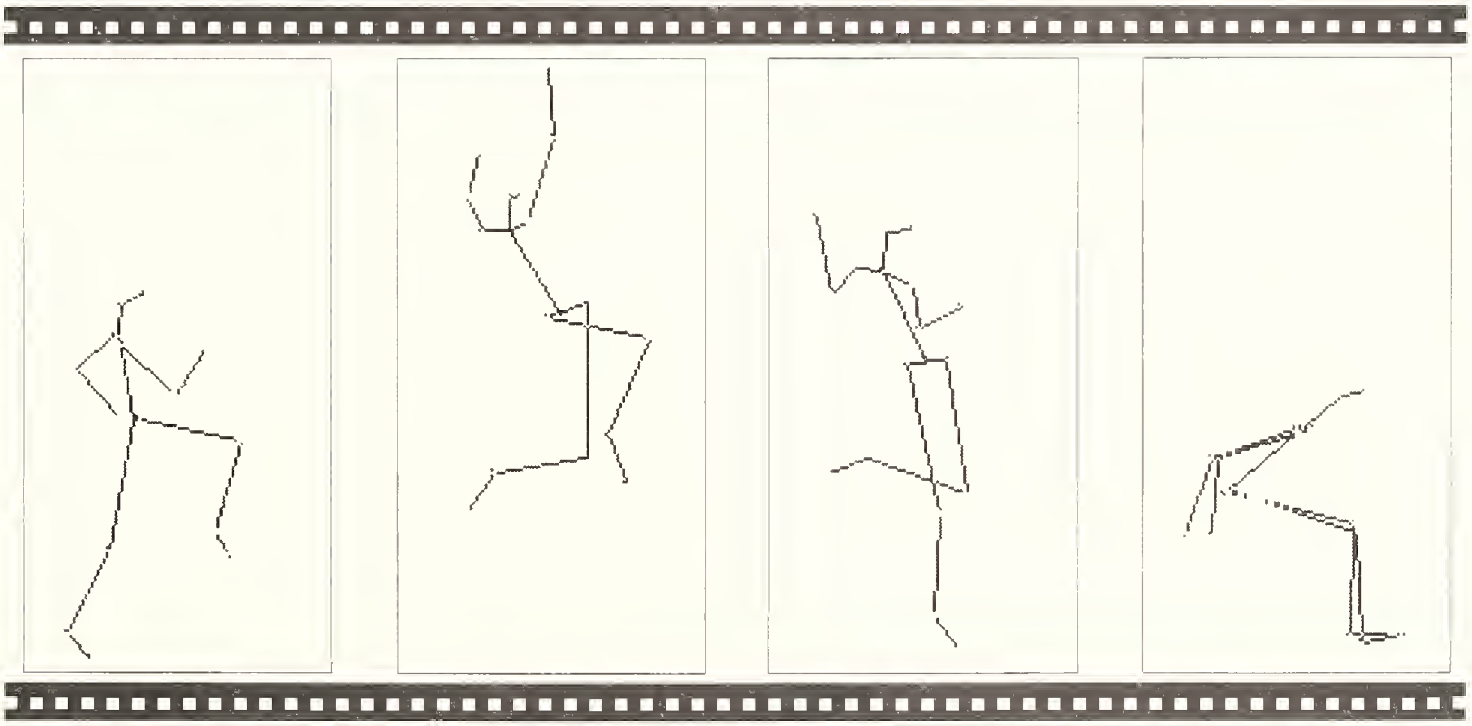
This review is of the PC version of the program. Models is also available for Macintosh computers.

Vendor:
Lascaux Graphics
7601 N. Calle Sin Envidia, Box 31
Tucson, Arizona 85718
USA

Hardware Requirements:
Available for IBM PC or compatible and Macintosh computers.
PC version requires CGA, EGA, VGA, or Hercules graphics adaptor.

Price:
US$89.95 (both versions)

Figure 3: Digitized still frames of a jumping athlete.



Maple Corner

News for Maple Users at U of T

Transforming Formulae

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Any mathematical formula can be written in a number of equivalent forms, and the one you choose is a matter of personal preference. The Maple developers have set certain defaults which might not necessarily be what you want. However, they also provide a lot of tools that allow you to force formulae into a number of different forms so that you may find something more to your liking. Below I illustrate how to transform a formula into a more compact form, and point out a procedure designed to help in such tasks. The procedure, called `edit`, is Maple's expression editor. Its main purpose is to help you to select various parts of an expression and perform some operations on them.

To begin, let us assume that I arrived at the following expression (in fact as a result of an integration):

```
                     4         2       2        2                    2
                   (q  - 4 ni q  - 4 q  + 4 ni ) ln(2 ni + 2 q - q )
      term2 := - 1/8 -------------------------
                                           3
                                          q

                    2        2         2    4                     2
                (4 q  - 4 ni  + 4 ni q  - q ) ln(2 ni - 2 q - q )
           - 1/8 -------------------------
                                       3
                                      q
```

We see that the polynomials in front of the logarithm are the same up to a sign. It would be logical to pull them out and combine logarithms. Let us see how `edit` can help in this task. To use `edit` we first have to read it from the Maple library:

```
readlib(edit);
```

and then we apply it to the expression 'term2':

```
> edit(term2);
                     4         2       2        2                    2
                   (q  - 4 ni q  - 4 q  + 4 ni ) ln(2 ni + 2 q - q )
         BOX(- 1/8 -------------------------
                                         3
                                        q

                    2        2         2    4                     2
                (4 q  - 4 ni  + 4 ni q  - q ) ln(2 ni - 2 q - q )
           - 1/8 -------------------------)
                                       3
                                      q
```

`Edit` puts a 'BOX' around the formula. Now we can move this BOX so that it surrounds just the part we need (for more information about the `edit` commands, refer to the help menu or the *Maple Library Reference Manual*):

```
> down:succ:down:succ;
                 4         2      2       2                   2
               (q  - 4 ni q  - 4 q  + 4 ni ) ln(2 ni + 2 q - q )
        - 1/8 -------------------------
                                        3
                                       q

                           2       2          2    4                   2
                   BOX(4 q  - 4 ni  + 4 ni q  - q ) ln(2 ni - 2 q - q )
             - 1/8 ---------------------------
                                                3
                                               q
```

To save space I have suppressed the output for the intermediate steps. The part surrounded by the BOX is referred to as '_' (underscore):

```
> coeff1:=_;
                                   2       2         2    4
                      coeff1 := 4 q  - 4 ni  + 4 ni q  - q
```

For my own reasons I want this coefficient to be divided by 4*q²:

```
> coeff2:=expand(coeff1/(4*q^2));
                                          2
                                        ni              2
                         coeff2 := 1 - -- + ni - 1/4 q
                                         2
                                        q
```

The second part of this expression looks like a square:

```
> coeff2:=1+factor(coeff2-1);
                                                       2 2
                                          (- 2 ni + q )
                        coeff2 := 1 - 1/4 -------
                                                2
                                               q
```

Right, but I'd rather have this second part as a simple square:

```
> coeff2:=1-(expand(sqrt(1-coeff2)))^2;
                                       /   ni        \2
                         coeff2 := 1 - |- -- + 1/2 q|
                                       \    q        /
```

That's better. Now let's substitute it to the original expression. First, however, we have to take into account that coeff1 was divided by $4*q^2$:

```
> term2a:=simplify(4*q^2*term2);
term2a :=

         4         2      2       2                    2                     2
       (q  - 4 ni q  - 4 q  + 4 ni ) (ln(2 ni + 2 q - q ) - ln(2 ni - 2 q - q ))
 - 1/2 ------------------------------------
                                           q
```

(In fact, we could have applied `simplify` to term2, making it more compact). Now substituting:

```
> term2a:=subs(-coeff1=-coeff2,”);
 term2a :=

           /      /  ni        \2\                   2                 2
           |- 1 + |- -- + 1/2 q| | (ln(2 ni + 2 q - q ) - ln(2 ni - 2 q - q ))
           \      \  q         / /
     - 1/2 -----------------------------------
                                              q
```

Let's combine logarithms now:

```
> term2b:=combine(“,ln);
                                       /            /  ni          \2\
                                       |      - 1 + |- -- + 1/2 q| |
                                       |            \  q           / |
                                       |- 1/2 -----------|
                      /              2\\               q             /
                      |2 ni + 2 q - q |
         term2b := ln(|--------|                              )
                      |              2|
                      \2 ni - 2 q - q /
```

That is not what I wanted! To combine only the logarithms I can again use the `edit` procedure:

```
> edit(term2a);
          /      /  ni          \2\                  2                     2
          |- 1 + |- -- + 1/2 q| | (ln(2 ni + 2 q - q ) - ln(2 ni - 2 q - q ))
          \      \   q          / /
BOX(- 1/2 ----------------------------------)
                                            q

___________________________________________

> down:succ:succ:succ;
       /      /  ni          \2\                     2                     2
       |- 1 + |- -- + 1/2 q| | BOX(ln(2 ni + 2 q - q ) - ln(2 ni - 2 q - q ))
       \      \   q          / /
 - 1/2 ------------------------------------
                                          q
```

Now we combine only terms in the BOX:

```
> use(combine(_,ln));
                                                                  2
                   /      /  ni          \2\        2 ni + 2 q - q
                   |- 1 + |- -- + 1/2 q| | BOX(ln(-------))
                   \      \   q          / /                      2
                                                    2 ni - 2 q - q
             - 1/2 -------------------------
                                            q
```

In fact, I would also like to cast the expression inside the logarithm into a different form.

```
> down;
                                                                  2
                   /      /  ni          \2\        2 ni + 2 q - q
                   |- 1 + |- -- + 1/2 q| | ln(BOX(-------))
                   \      \   q          / /                      2
                                                    2 ni - 2 q - q
             - 1/2 -------------------------
                                            q
```

After massaging the expression in the BOX I get:

```
                                        ni
                                       -- - 1 - 1/2 q
      /      /   ni         \2\          q
      |- 1 + |- -- + 1/2 q| | ln(BOX(-----------))
      \      \    q         / /         ni
                                       -- + 1 - 1/2 q
                                         q
- 1/2 -------------------------
                               q
```

and finally

```
> top:term2c:=_;
                                                 ni
                                                -- - 1 - 1/2 q
                    /      /   ni         \2\     q
                    |- 1 + |- -- + 1/2 q| | ln(-----------)
                    \      \    q         / /    ni
                                                -- + 1 - 1/2 q
                                                  q
      term2c := - 1/2 -----------------------
                                              q
```

When you finally arrive at a form which you like and you want to show it to others (i.e., publish it), Maple allows you to output formulae in a form suitable for inclusion in documents. You have a choice of either LaTeX code or an `eqn` code (`eqn` is a program available under UNIX for typesetting equations. It works with `troff`.). Below you see what the above formula would look like in a document using an `eqn` code:

$$\frac{\left[\left[\frac{q}{2}-\frac{ni}{q}\right]^{2}-1\right]\ln(\frac{\frac{ni}{q}-1-\frac{q}{2}}{\frac{ni}{q}+1-\frac{q}{2}})}{2q}$$

Thus you can see how, with a bit of work, Maple's flexibility allows you to transform formulae into a format that you prefer.

Selecting Modems

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A modem is a useful device: it allows you to connect your computer to the rest of the computing world and all that this world has to offer. With the rapid advances in technology, the range of modems currently available, along with the features each different type supports, has grown to the point where it has become very confusing when selecting a new unit or when trying to get an existing unit to work. The purpose of this article is to try to help you understand the "alphabet soup" of hardware features in today's modem market.

First of all, what is a modem? The word "modem" is an acronym for MOdulator/DEModulator. Simply put, a modem converts the digital signals a computer uses into analog signals (voice is an example of an analog signal) so that they can be transmitted over regular voice-grade telephone lines. A modem is required because, for reasons we won't get into here, digital signals don't travel very well over long distances. Furthermore, the telephone system has been optimized to transmit analog signals with a frequency range equalling that of the human voice.

Modems transmit information to other modems at a certain number of bits-per-second (commonly written as "bps"). The bps rate of a modem is the "amount" of information transferred per second. To get a rough estimate of how many characters per second this is, just divide the modem's speed by ten. For example, a 2400 bps modem will transmit approximately 240 characters per second.

The other term used quite often when speaking about modems is "baud rate," or simply "baud." The baud rate is the rate at which one modem is "signalling" or talking to the other modem. Except for 300 bps modem communications, the baud rate significantly differs from the information transfer rate (bps) we discussed above. Modems work by encoding the information being transferred into groups of bits. For example, a modem transmits a particular signal that means that the information bits 0 and 1 have been sent. Thus, two bits are sent for each signal the modem generates. People often refer to the speed of a modem as its baud rate; as you can see this is technically incorrect.

Types of Modems

Modems speak to each other by using a predefined language or protocol. The protocol is a set of rules which defines how two modems must talk to each other. Over the years, there have been many protocols developed, and as technology has progressed, each protocol has become progressively more efficient.

Bell 103B

One of the first protocols to go into general use was the Bell 103B protocol. This is the protocol used for 300 bps communication. These 300 bps modems are now largely obsolete; however, a few services that do not require transmission of large amounts of information (like time reference services and credit card verification services) still use them. Most modern modems still support this protocol. This protocol was developed by Bell and has become an industry standard.

Bell 212A

The Bell 212A protocol came into the home market in the mid-to-late 1970s. Like the Bell 103B, it is largely obsolete. The Bell 212A standard transmits at 1200 bps. Like the Bell 103B protocol, 212A was developed by Bell and has become an industry standard also.

CCITT V.22bis

In the mid-1980s, a new standard emerged that allowed computers to talk at 2400 bps over regular telephone lines. This standard is an international standard which has been defined by the International Consultative Committee for Telegraphy and Telephony (or CCITT).

CCITT V.32

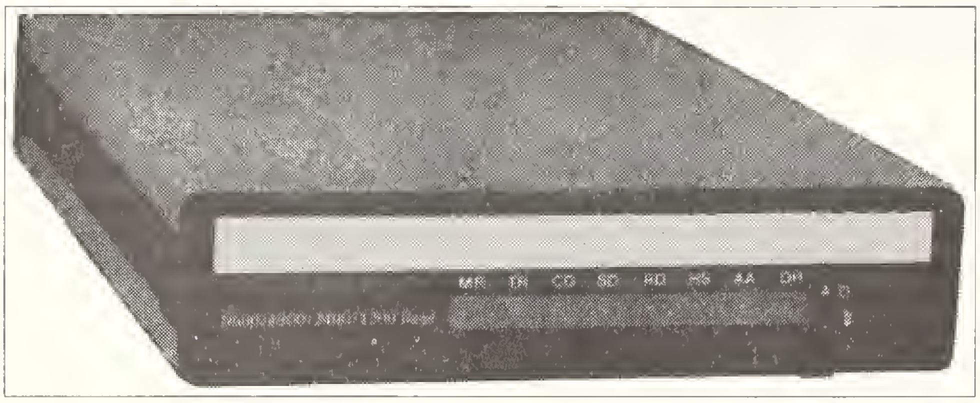
In the late 1980s, more sophisticated electronics allowed dial-up modems to take another leap in speed from 2400 bps to 9600 bps. V.32 is the international 9600 bps telecommunication protocol for dial-up modems.

CCITT V.32bis

Further refinements to the software and hardware in V.32 modems allowed for the development of the V.32bis protocol, which is an extension of V.32 that allows two modems to talk to each other at 14,400 bps. Some existing V.32 modems, such as the Hayes Ultra-9600V Series, can be upgraded from V.32 to V.32bis by replacing the ROM chip.

Other Protocols

In the years between the development of the V.22bis and the V.32 modems, a number of other proprietary protocols were developed by various modem manufacturers in an effort to get a higher throughput from



This is what an average modem looks like.

their product. Examples of this are the US Robotics HST protocol and the Hayes V-Series (not the Ultra V-Series) lines of 9600 bps modems. These proprietary protocols are now largely obsolete. Modem protocols are very specific, and we often get calls from users who have one of these modems and wonder why they can't establish communications with our modems. Simply stated, these modems use a protocol which our modems don't understand.

Another type of modem that is becoming popular in the modem market is the the so-called fax modem. These modems generally support both the common dial-up modem protocols, like V.22bis and V.32, along with the V.29 9600 bps protocol used by Group III fax machines. You must have the proper software for these modems to work correctly.

Modems and Error Correction

One of the problems of transmitting information over telephone circuits is noise. You may have noticed noise on the line when you're talking to someone and the line seems to crackle, or maybe you've heard a continuous load hiss in the background. Humans can tolerate these problems. Modems cannot. Because of the way modems work they are very susceptible to noise problems. When a modem encounters noise on a line, it cannot decode the signal and so it ends up spitting out a bunch of unintelligible characters onto the screen, such as ~]@#$@#%!

Error detection and correction protocols work by taking the information being sent from the computer and putting it into a packet, which is a kind of electronic envelope. Once the information has been collected and assembled into this packet, a mathematical algorithm is applied to the information and a unique number is calculated for the contents of the packet. The packet, along with its number, or checksum, is transmitted over the link and received by the other modem. When the other modem has the complete packet of information, it recalculates the checksum and compares it to the original. If the two numbers match, everything has been received correctly and the contents of the packet are forwarded to the computer. If the numbers do not match, the modem knows the information has been corrupted, probably by line noise, and sends back a message asking the other modem to retransmit the information.

Types of Error Correction Protocols

MNP

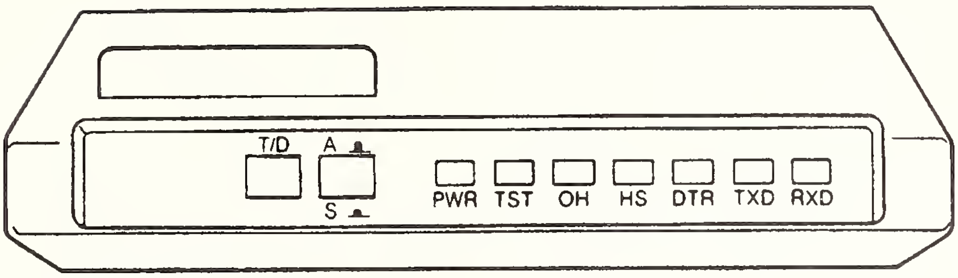
The first popular way around this problem was developed by a company called Microcom. They started incorporating a protocol called Microcom Networking Protocol or MNP into their modems. In addition, Microcom licensed MNP to other manufacturers, then eventually put portions of it in the public domain. The MNP protocol commonly implemented in modems encompasses levels 1 through 5, often referred to as MNP 1 to MNP 5. However, only MNP 1 through 4 are concerned with error detection and correction.

In MNP, each higher level is downwardly compatible with all lower levels. Upon establishing a connection using one of the standard link protocols like V.22bis or V.32, the two modems, if each supports MNP, will attempt to negotiate a reliable connection using the highest level of MNP common to each unit. Once this is done, any noise that occurs on the line causes the modems to automatically attempt to correct the problem before the information is passed to the computer. There are two common protocols currently in use at this time for error detection and correction: MNP 4 and V.42.

MNP 4 was the last of the error correction protocols developed by Microcom. Although there are higher levels of MNP, these are not used for error correction. As we shall see on the following page, levels above MNP 4 are concerned with trying to squeeze more data through the communication channel.

MNP 4 improved on its predecessors by allowing the packets of information to vary in size. This has the advantage of providing higher throughput to file transfers because of the lower "packet overhead to information transferred" ratio. Also, smaller packets work better for interactive users by causing a minimum amount of delay in waiting for the packet to fill before it is sent.

MNP 4 also strips off useless information normally used by computers when communicating over serial links. This saves approximately two bits per character



Front view of an AX/2400 modem.

transmitted. The net result is that a modem supporting MNP can actually achieve about a 120% throughput as compared to a regular non-error correcting unit.

V.42

V.42 is a more recent international standard for error-correction developed by the CCITT. It is actually a superset of MNP 4; Microcom contributed to the development of the V.42 standard. Newer modems are starting to incorporate V.42 in favour of MNP 4 because it uses less overhead to accomplish the same task and is therefore more efficient.

Error Correction and File Transfer

One problem with error-correcting protocols like MNP 4 and V.42 is that they tend to conflict with certain simple file transfer protocols like Kermit and XModem. Trying to run both MNP and Kermit together, for instance, will cause the transfer efficiency to drop to about 50% (in other words you'd be getting the same throughput from a non-error-corrected 1200 bps modem as from your error-corrected 2400 bps modem). Normal file transfer efficiency is usually around 80% for Kermit. Recently there have been a number of file transfer protocols that have been designed specifically to take advantage of error-corrected links, such as C-Kermit, YModem-G and ZModem. By using protocols designed to work with error-corrected modems, transfer efficiency usually in the range of 92-94% is common.

Modems and Data Compression

In trying to get higher throughput over a modem link channel, Microcom developed a method of on-the-fly data compression called MNP 5 for their modems. More recently, the international standard protocol V.42bis has become popular. V.42bis is a superset of MNP 5 and is more efficient. However, both protocols attempt to achieve the same result.

Data compression protocols work by taking in information at a higher rate, for example 19200 bps on a 9600 bps modem, and compressing the information so that it takes fewer bits to transmit. At the other end, the information is expanded back to its original form. This works very well for word processing and database files, but binary files, such as applications and pre-compressed archive files, generally compress very little. MNP 5 is not able to recognize when a file is incompressible and will actually tend to increase the size of the file. The V.42bis protocol is more intelligent and can recognize binary files and thus not try to compress them further.

In using MNP 5, it is theoretically possible to get double the throughput on a modem line (i.e., 4800 bps from a 2400 bps modem, 19200 from a 9600 and so on), although, practically, this generally works out to be about one and a half times the normal link speed throughput. With V.42bis the theoretical compression factor is four to one. The best I have seen is three to one.

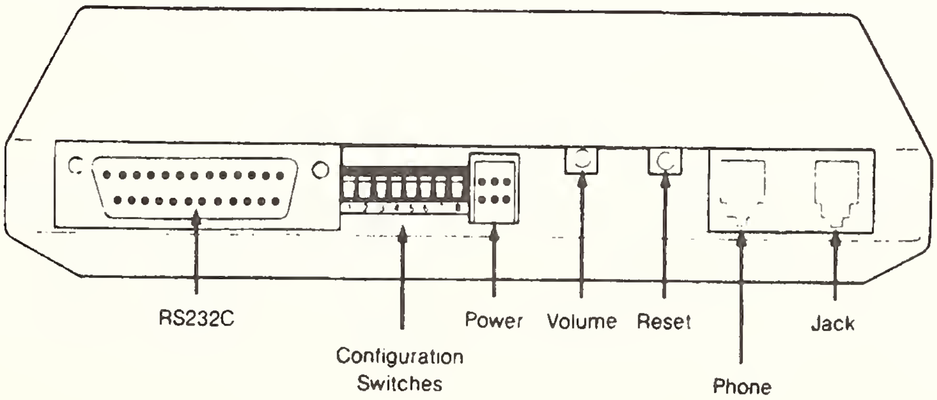
Modem Purchasing Considerations

Below is a list of some things you might want to take into consideration before you buy a modem.

1. Error correction compatibility

These days, all but the least expensive modems include MNP 5. It is well worth paying the extra expense for an error-correcting modem. It will save you hours of frustration and most dial-in services now support it. Unfortunately, buying an error-correcting modem does not eliminate all problems. MNP is provided to manufacturers as a protocol specification only. It is up to each manufacturer to implement MNP in their products. Some

Rear view of an AX/2400 modem.



implementations are better than others and, because of this, you will find that not all error-corrected modems will talk to all other error-corrected modems. In this case, try first turning off data compression. If this doesn't work, try turning off error-correction altogether. You may end up having to purchase a different brand if you find the modem you bought is not 100% compatible with the principal service you access. On the positive side, however, most newer implementations of MNP are 100% compatible, so these mismatched protocol problems are slowly disappearing.

2. Communication software and hardware flow control

When you purchase a modem that supports data compression, you need to be sure to get communication software and modem serial cables that support hardware flow control. Flow control is used to tell the computer attached to the modem to stop sending information while the modem catches up to what has already been sent. Remember, the computer is connected to the modem through a serial line that is running at twice the modem's link speed in the case of MNP 5, or four times the link speed in the case of V.42bis, and that the efficiencies of these protocols often are not 100%. What happens is that the information to be transmitted backs up in the modem. If too much information starts to back up, the modem must tell the computer to stop sending it information. Hence the need for flow control. If the modem can't tell the computer to stop sending it information, some information will be lost. There are two types of flow control used by modems: hardware and software. The reason we need hardware flow control instead of software flow control is that software flow control tries to insert special characters into the data stream which the communication application running on the computer must understand as stop and go commands. Unfortunately, this plays havoc when programs are trying to do things like file transfers. Hardware flow control, on the other hand, uses special wires from the modem to the computer to signal the computer to stop sending information. This does not affect the information contained in the data stream.

Additionally, make sure the cable you get supports what are called the RTS and CTS signals. This is usually the case for PC users; however, Macintosh users must specifically request this type of cable. An ordinary Macintosh modem cable will not work. A number of manufacturers provide this special cable with their MNP 5 or V.42bis products and on special order, notably Hayes and Zoom Telephonics, or you can have a cable custom made. Once you have the right cable, you must make sure both the modem and the communication software you are using are configured for hardware flow control. Get the sales person to help you if you're having difficulty understanding what has to be done.

3. Other compatibility considerations

When purchasing a new modem, especially a 9600 or 14400 bps unit, be very careful to make sure you are buying a modem that supports either the V.32 or V.32bis protocol. Otherwise, you will only be able to communicate with modems made by the same manufacturer. However, they are usually significantly more expensive than just a single standard modem, and consideration should be given to the cost/benefit of these units.

4. Fax modems

If you are considering buying a fax modem, be sure to verify which fax features you are actually getting. Many of these units have send capability only. Also, some manufacturers advertise their units as being able to communicate with other modems at 9600 bps. This is true as long as the other modem supports the fax standard. A 9600 bps fax modem will not communicate with a 9600 bps V.32 modem. One additional consideration is software. Make sure you are getting software that will allow you to use the fax features of the modem. If not, be sure to include this in your pricing comparisons.

The Future

What does the future hold for telecommunications? Right now we are almost at the limits of information transfer capacity available on a standard analog telephone voice circuit. The next major step in telecommunications will be the implementation of the Integrated Services Digital Network or ISDN. ISDN is the final step in the evolution of our telephone system to a completely digital system. ISDN transforms the link from the phone on your desk from analog to digital.

Basic Rate ISDN, which is what will be used in the office and perhaps later in the home, offers two 64000 bps communication channels and an additional 16000 bps communication/signalling channel. Any of these channels could be used by a computer for communications. There's even the possibility of combining the two 64000 bps channels into a single 128000 bps channel. Because it is almost four-and-a-half times faster than the current analog technology, ISDN offers a lot of potential in providing high-speed communication services between computers.

ISDN will not use the current modem-based technology, but rather will require an interface generally referred to as a transceiver or line driver. Expect to see ISDN services first becoming available to the public about the middle to the end of this year, and like most things, it will be very expensive when first introduced.

The Erindale Computing Facility is one of the many managed by UTCS. The main computer centre is located in Room 2039 of the South Building. The facility coordinator is Joe Lim and the support programmers are Gord Cook and Ferucio Ciobanu. Ferucio is on loan to Erindale until May, 1992. The main contact for the Facility Management Team at Erindale is the Dean of Sciences, Professor J.R. Percy.

The centre has a collection of hardware and software to support both the instructional and research needs of Erindale College. Below is a list of what is available:

Students in the Erindale PC lab.

A Look at the Erindale Computing Facility

- A SUN 3/280 which supports both undergraduate and research work. Main users of this machine are students in Computer Science and Statistics courses. The SUN 3/280 is the main electronic mail gateway for Erindale;
- A VAX 8200, running VMS, which supports research work;
- A Gandalf Data Switch for access to the SUN and VAX at Erindale and to the different services available from the UTCS PACX network. The switch also supports FELiX and access for the Erindale Library;
- A network of IBM PS/2 Model 25 PCs for undergraduate courses. These PCs are on a Novell local area network (LAN) and the main users are students in Computer Science, Commerce, and Professional Writing courses;
- A network of Macintosh IIcx computers for undergraduate courses. These Macintoshes are on a localtalk LAN and the main users are students in Anthropology, Professional Writing, Sociology, Biology, and Geological Science courses;
- An OMR Scanner for multiple exam and survey analysis.

Apart from providing the aforementioned equipment to our users, here are some of the other services that we provide:

- Advising help for undergraduate students;
- Computing consulting to the College users;
- Laser printing services for students and faculties;
- Support for LANs at the Registrar's Office, Library, Business Services, and Campus Relations;
- Management of software site licences for the College.

There are two committees which help the College deal with emerging technologies and its implications. The Subcommittee on Computing and Data Communications acts as a resource for the College community by advising on computer hardware, software, and networking as they affect administration, academic, and research activities. The Subcommittee makes recommendations to the College Administration on:

- College policy relating to computing and data communication;
- the feasibility of adopting specific advancements in computing and communication technology at the College.

The second committee is the Task Force on Multi-Media Instruction which will look into the future direction and development of the Micro-Electronics and Media Centre at the College. It will also provide advice on the best approach to the introduction of multi-media in teaching at Erindale.

The Chairman for the Subcommittee on Computing and Data Communications is Professor G.S. Graham, while the Chair for the Multi-Media task force is Mr. Clive Horsfall.

With the new Kaneff Centre building due to be completed very shortly, the Erindale site will grow even larger and some exciting prospects for computer-assisted instruction are on the horizon.

Joe Lim
joe@credit.erin.utoronto.ca

New INTERNET Publication Available

Herb Kugel
herb@gpu.utcs.utoronto.ca

Those familiar with the INTERNET and the File Transfer Protocol should be aware of a new publication that can be most useful.

The following is taken from the announcement of the new document:

> A new For Your Information (FYI) Request for Comments is now available in online RFC libraries.
> FYI: 10:
> RFC: 1290:
> Title: There's Gold in them thar Networks! or
> Searching for Treasure in all the Wrong Places
> Author: J. Martin
> Mailbox: jmartin@magnus.acs.ohio-state.edu
> Pages: 27
> Characters: 46,997
> Obsoletes/Updates: none
> This document was presented at the 1991 ACM SIGUCCS User Services Conference. It appears here in its updated form.
> There is a wealth of information on the network. In fact, so much information, that you could spend your entire life browsing. This paper will present some of the "gold nuggets" of information and file repositories on the network that could be of use to end users.
> The ultimate goal is to make the route to these sources of information invisible to the user. At present, this is not easy to do. The author will explain some of the techniques that can be used to make these nuggets easier to pick up so that we can all be richer.
> FYI RFCs can be obtained via FTP from FTP.NISC.SRI.COM, NIS.NSF.NET, NISC.JVNC.NET, VENERA.ISI.EDU, WUARCHIVE.WUSTL.EDU, or NIC.DDN.MIL.
> Instructions for retrieving FYI RFCs may be found in the file "in-notes/rfc-retrieval.txt" on VENERA.ISI.EDU.

For those unfamiliar with For Your Information/Request for Comments publications, they will be discussed in a future article. File Transfer Protocol (FTP) has been discussed in previous articles, but if you would like this particular publication and have difficulty in obtaining it, please contact me via electronic mail at *herb@gpu.utcs.utoronto.ca.*

Discussion List Information and the INTERNET

Herb Kugel
herb@gpu.utcs.utoronto.ca

One major difficulty often faced by researchers who use a computer is finding out about various discussion lists dealing with topics in which they may be interested. One solution to this problem may be obtained through the INTERNET using the File Transfer Protocol (FTP) in the UNIX environment. The SRI Corporation of Menlo Park, California, maintains and periodically updates a file called "interest-groups" which contains a considerable amount of information about various discussion lists that are available and accessible. Obtaining the list is quite simple, as the following shows. Text that you are to type is preceded by a pointing hand.

```
gpu.utcs%                        ☛ ftp ftp.nisc.sri.com
Connected to phoebus.NISC.SRI.COM.
220 phoebus FTP server (SRI Version 1.98 Fri Apr 19 11:57:54 PDT 1991) ready.
Name (ftp.nisc.sri.com:herb):    ☛ anonymous
331 Guest login ok, send ident as password.
Password:                        ☛ herb                  (Type your account name or logon id.)
230 Guest login ok, access restrictions apply.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>                             ☛ type ascii
200 Type set to A.
ftp>                             ☛ cd netinfo
250 CWD command successful.
ftp>                             ☛ get interest-groups
200 PORT command successful.
150 Opening ASCII mode data connection for interest-groups (800407 bytes).
226 Transfer complete.                                            (This line and the next take
819137 bytes received in 4.1e+02 seconds (2 Kbytes/s)               a while to appear.  Be patient.)
ftp>                             ☛ bye
221 Be Excellent to one another!
gpu.utcs%                                                  (You continue your session from here.)
```

The "interest-groups" file thus obtained is rather large, containing some 19,000 lines. In addition to the list name and instructions for subscribing, the file contains the names of the people responsible for the list, as well as a discussion of what the list is about and at whom it may be aimed. This can be a very helpful tool for the researcher. If you have difficulty in accessing this list, or any other questions concerning the INTERNET, please send electronic mail to *herb@gpu.utcs.utoronto.ca*.

Office Security

Wilfred L. Camilleri

No mechanical devices – locks, closed circuit television cameras, alarm systems, safes – can function effectively without the cooperation of the people they are designed to protect.

University assets, including information and data, are made available to you to help you do your job efficiently and effectively. Tools, such as personal computers, FAX machines, and copiers are made available to you so that you can be more productive as well as to make your job easier. However, these same tools can harm the University if they are abused or used for unauthorized purposes.

Protection of data and information starts with good physical environment security. Observe what's going on around you, report anything that might threaten employees' safety or University property, and protect assets entrusted to you or to which you have been given access. You can help make the University of Toronto a safe place to work and help the University to protect its assets.

Handling Confidential Information

- Do not leave confidential or other sensitive documents out in the open or unsecured.
- Do not share or talk about confidential information with unauthorized staff or other individuals who have no right to know about it.
- When disposing of confidential or sensitive information, dispose of it properly. Shred paper documents and carbon paper; erase files on magnetic media using Norton "WIPE" or similar utilities or by degaussing; grind microfilm and microfiche.
- Clear your desk and put away all documents, files and diskettes before leaving for a break or when leaving for the day.

Personal Computers and Terminals

- Always log off when you are finished using your computer or computer terminal.
- Never leave diskettes lying about. Lock them up in a desk drawer or a filing cabinet, preferably one located away from your workstation.
- If your computer or computer terminal has a lock, use it before leaving for the day.
- Make sure that you have noted the serial numbers of your computer equipment and other office equipment, including keyboards, modems, computer mouse, video display terminals, and so on. Mark all equipment with an identification number using an engraver.
- Make sure all office equipment is turned off at the end of the day.

Know your co-workers and look out for each other

- Ask a co-worker to watch your desk while you're out for lunch or away for an extended period.
- Find someone who leaves at the same time as you do and walk together to the parking lot or transit, or use the WalkSafer Service (call 978-SAFE for more information).
- If a co-worker is a victim of a crime, offer to talk about it, and help with things like replacing User IDs and documents, contacting victim services, and covering appointments or workload when your co-worker is away.
- Be discreet. Don't advertise your social life or vacation plans and those of your co-workers to strangers visiting your place of work or enquiring about co-workers over the phone.
- If you provide some sort of service to other employees of U of T and

you're going to be away from your desk, ask someone to answer your phone or have the calls forwarded to another phone.

- Always let someone know where you'll be, whether you're coming in late or going to lunch or a meeting. If you have an accident or there is a family emergency, someone will have an idea about where you are and eventually will be able to locate you.

Protect your personal belongings

- Keep your purse and other valuables and personal belongings with you at all times or locked in a drawer or cabinet. Don't leave a purse on a desk or next to your chair, or a wallet in a jacket that is left hanging on a chair or a coat rack.
- Never leave your keys lying about.
- Never leave change or cash on a desk or in an unlocked top drawer.
- If you bring any personal items to work, such as a radio or a calculator, make sure they are engraved with your name or initials and an identification number.

Be alert and prepared

- Park in an area that is always well lighted.
- Keep emergency numbers such as those of the University Emergency Centre (2222), the Campus Police (2323), the Metro Toronto Police, and the fire department posted on or near your phone.
- If you are responsible for office keys, don't leave them on your desk or in a drawer where they could be easily taken and copied. Only give keys to persons who have a legitimate need and are authorized to receive the keys. Make sure the keys are returned.
- Never write down combination lock numbers, personal identification numbers (PINs) or computer passwords.
- Report any theft of personal belongings or U of T property to your supervisor right away.
- Know the location of fire exits on your floor.
- Check the identification of anyone who asks for confidential information or of any delivery or repair persons who want to enter an area restricted to employees. Don't be afraid to call the person's department or company for verification. This could prevent possible theft, vandalism, or assault committed by strangers.
- If you notice any suspicious persons or objects, notify the Campus Police right away. Be especially alert after business hours.
- When you are working in an office after business hours, do not be afraid to call the Campus Police to let them know you are in the building.
- Report any broken or flickering lights, dimly lit corridors, doors that don't lock properly, and broken windows to Facilities and Services.

The University of Toronto Police, in cooperation with the Metropolitan Toronto Police Force, offers a program designed to protect your property from theft and to facilitate identification of lost and stolen property. This program is called Operation Provident. Please call the University Police for further information at 978-2323.

Learn More About Communications

Free Electronic Mail Demonstration

April 14, 1992 3:00–5:00 p.m.

Anyone interested in sending documents to colleagues or friends reliably, quickly, and inexpensively will not want to miss this demonstration. We will introduce you to the NetNorth/BITNET/EARN communications network, which is accessible from the CMS system. This network connects more than a thousand universities and research institutes in Europe, Asia, and North America. Sending documents or files over the network is very easy to learn.

We will show you how to send mail and files to another institution, and how to talk directly to someone on the network. ***Please note this is a demonstration only.***

Space is limited. If you would like to attend this demonstration, please contact Irene Rosiecki at 978-4565 to reserve a place.

ProComm Communications Program Seminar

April 14, 1992 1:00–3:00 p.m.

ProComm is a general purpose communications program currently available to all U of T faculty, staff, and students. It is suitable for connecting to the many networks on campus.

A seminar has been scheduled to introduce ProComm and its various features: terminal emulation (a number of popular ones will be reviewed); the dialing directory; file transfer protocols, such as Kermit and XMODEM; configuration and modem parameter settings; and the DOS gateway, which allows you to execute DOS commands and other programs while you are still in ProComm.

There is a fee for this seminar. To reserve a place in this seminar, please contact Irene Rosiecki at 978-4565.

Microcomputer Short Courses

Irene Rosiecki
rosiecki@vm.utcs.utoronto.ca

UTCS offers various noncredit microcomputer courses to faculty, staff, and graduate students of the University of Toronto. These courses cover a number of software programs available for the PC or the Macintosh. Whether you will be typing a thesis on a word processor, or working with spreadsheets, databases, or desktop publishing, we may be able to help you get started.

Our class sizes are small to allow for much individual attention. In most cases, continuing support is available upon completion of a course.

The following is a list of the microcomputer courses taught at UTCS:

- Introduction to dBASE IV
- Introduction to Disk Operating System (DOS)
- Electronic Mail Seminar
- Excel on the Macintosh
- Introduction to FoxBASE+/Mac 2.0
- Introduction to HyperCard
- Introduction to Lotus 1-2-3
- Introduction to PageMaker
- ProComm Communications Seminar
- Introduction to SAS on the PC
- Intermediate SAS - Data Processing
- Intermediate SAS - Statistics
- SAS/Graph Seminar
- Microsoft Word on the Macintosh
- Introduction to WordPerfect 5.1
- Advanced WordPerfect 5.1 Topics

To find out about course dates and registration procedures, or to book a place in any of these courses, please contact Irene Rosiecki at 978-4565. Courses are filled on a first-come, first-served basis. The more popular courses fill up quickly, but waiting lists are maintained in case of cancellations.

Facilities Managed by UTCS

Administrative Computing
- administrative ORACLE, IMS, DB2, TS0, Batch
- 3081K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/PC
- 88 NEC computers connected in a Local Area Network:
  - Robarts Library (Rm. 1061A): 36 NEC PCs
  - St. Michael's College (Rm. 107): 26 NEC PCs
  - Sidney Smith (Rm. 1071): 23 NEC PCs
  - Trinity College (Rm. 024): 3 NEC PCs
- MS-DOS with Turing environment
- introductory computer science

Computers in Quantitative and Empirical Science Teaching (CQUEST)
- 52 DEC VT1000 X Window terminals, 20 DEC 2100 workstations connected in Local Area Network:
  - Ramsay Wright (Rm. 211, 213): 29 DEC VT1000s, 10 DEC 2100s
  - Sidney Smith (Rm. 2105): 20 DEC VT1000s, 10 DEC 2100s
  - Departmental use: 3 DEC VT1000s

Public Sites
- 50 XT100 terminals connected to PACX
  - Robarts Library (Rm. 1061A): 24 terminals
  - Engineering Annex (Rm. 107B): 12 terminals
  - St. Michael's College (Rm. 107): 9 terminals
  - Victoria College (1st floor): 3 terminals
  - Trinity College (Rm. 024): 2 terminals

Erindale College Systems

SUN 3/280, 16 megabytes of memory
- instructional and rasearch access using UNIX

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

Ontario Centre for Large Scale Computation (OCLSC)
- Cray Research Inc. X-MP/28
- 2 processors, 8 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- UNICOS 5.1.11 operating system
- VAX 8350, MicroVAX-II, VAXstation 3200, and SUN-3/280 provide front-end services

> *The mission of Computing and Communications (UTCC) is to provide services, facilities, and expertise that ensures that the University of Toronto is a leader in the cost-effective utilization, management and evolution of information technology in support of the research, teaching, library, and administrative goals of the University.*

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS
Technical Assistance: 978-6602
- General Purpose Timesharing environment
- Hub of the NetNorth network with access to BITNET, EARN and the Internet
- 4381-R03 processor with 32 megabytes of memory
- CP operating system, VM/SP HPO R6
- CMS timesharing system, VM/SP Release 6
- FTP and TELNET access to the campus Ethernet, as well as Internet
- RSCS spooling system, Release 2.3

GP UNIX
Technical Assistance: 978-8853
- General Purpose Timesharing under SUN UNIX 4.1.1
- SUN 4/490, 32 megabytes of memory
- access to Linotronic typesetter
- full access to USENET, an electronic technical information exchange facility
- full access to the Internet, UUCPNET, BITNET, CDNNET

Services

Facility Management Support
Primary Phone: 978-5050
- Installs, maintains and upgrades microcomputer systems, particularly Macintoshes, IBM PCs and compatibles on a contract basis or on a cost-per-call basis.

Network Development & Support
Primary Phone: 978-7087
- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- provides access between the IBM systems and machines using UNIX, VMS, and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; CA*net, the Canadian National Network; and USENET, the UNIX networking fraternity
- will provide a communications solution to department needs on a contractual basis

User Support Services
Advising and Consulting
Primary Phone: 978-HELP
- The Advising and Consulting group is available to University faculty, staff, and graduate students.
- provides phone-in advising, and consultations by appointment for the following products:
  - operating systems: DOS, Macintosh System & Finder
  - packages and libraries: SAS, SPSS, SYSTAT
  - word processors: WordPerfect, Microsoft Word
  - databases: dBASE IV, FoxBASE
  - spreadsheet. Lotus 1-2-3, Microsoft Excel
  - file transfer: ProComm, MacKermit
  - electronic mail: QuickMail

Information Technology Support
Primary Phone: 978-5601
- selection consulting for hardware and software
- Micro Lab for evaluation of hardware and software
- CD-ROM access to software and information discs
- offers phototypesetting service

Administration and Information Services
Primary Phone: 978-4462
- administers Local Area Network of PCs for Education Facility
- administers Macintosh Education Facility
- administers site licences for various software packages
- provides short courses and seminars on the more popular services and software packages
- provides accounting services for all UTCS services
- provides accounting services for the University's telephone system on behalf of the Voice Communications Department
- produces *ComputerNews* and the UTCC newsletter

Telephone Listings

Consulting and Enquiries

Account & Access Code Enquiries	Jason Pante	BC101B	978-7148
Communication, Networking & Hardware	Rosi Derka-Tseu	BC105	978-7087
Erindale College	Joe Lim	ER2035	828-5311
IBM & Macintosh Maintenance	Rosi Derka-Tseu	BC103	978-1299
Information Office / Site Licences	Evelyn Ward	BC201	978-4990
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
Network Operations Centre	978-4621
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-3959
Interactive Services 1200 (bps)	978-395
Interactive Services 2400 (bps)	978-7239
Interactive Services 9600 (bps)	978-7220

UTCS Directory

Management Office General Enquiry				978-4462
Director:	Dr. Warren Jackson	BC118	978-8948	wcj@vm.utcs.utoronto.ca
Associate Director, Operations:	Eugene Siciunas	BC116	978-5058	eugene@vm.utcs.utoronto.ca
Managers:				
Computer & Network Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP350	978-3579	bill@vm.utcs.utoronto.ca
Facility Management Support	Vera Cabanus	BC312A	978-7107	vcabanus@gpu.utcs.utoronto.ca
User Support Services	Don Gibson	BC312	978-7331	gibson@utcs.utoronto.ca
Network Development & Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Administration & Information Services	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca

Legend:
BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA), 11 King's College Road, Room 107B
Erindale College (Erin), 828-5339, 3359 Mississauga Road North, Erindale Campus, Rooms 2037, 2045
Ramsay Wright, 25 Harbord St., Rooms 211, 213
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Room 1071, 2105
St. Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskin Ave., Room 024
Victoria University, 73 Queen's Park Cres., 1st floor

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	12:00-18:00	12:00-18:00	closed	closed	Research	978-HELP
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2045)	9:00-22:00	9:00-22:00	12:00-18:00	12:00-18:00	None	Rm 2005
Ramsay Wright	7:00-21:00	7:00-18:00	closed	closed	Undergrads	No
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St. Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites	Advising Hours
CAO	Monday through Friday, 12:00 - 18:00
Erin	Monday through Friday, 09:00 - 22:00

* Research includes graduates, faculty, staff

Computer and Printer Access

Sites	PACX	CDF/PC	CQUEST	Printers
EA	Y			Y*
Erin	Y			Y*
Ramsay Wright			Y	Y**
Robarts	Y	Y		Y*
Sidney		Y	Y	Y**
St. Michael's	Y	Y		Y*
Trinity	Y	Y		
Victoria	Y			

(Y=yes, N=no)
* Public Printers **Site Only

UTCS Site Licences

UTCS administers a number of software site licences available to the University of Toronto community. (Usually, this means faculty, staff, and graduate students, though some licences apply to undergraduate students also. See "Restrictions" in the table below.) The licences provide a variety of software at much-reduced cost. The majority of the licences must be renewed each year. Most are terminated when you leave U of T.

Each licence has a contract that you must complete. It outlines your responsibilities and any limitations in the use of the software. All contracts and software are available from the UTCS Information Office, 4 Bancroft Avenue, Room 201. To qualify as a member of the U of T community, you must provide a valid Employee number or Student number.

The table below describes the available site licences. The Restrictions column specifies who may purchase the licence. If the restriction is Research, the payment must come from research money. The Diskettes/Distribution column describes how you actually receive the software. Large packages, like SAS and SPSS, require that you borrow the diskettes, install the software, and return the diskettes. Smaller packages, consisting of up to five diskettes, require you to bring your own diskettes.

For more detailed information about these site licences, telephone the UTCS Information Office at 978-4990.

Site Licences at UTCS

Product/ Operating System	Cost	Restrictions	Licence Period	Diskettes/ Distribution	*
Chaos in the Classroom I: Maps and Bifurcations					
PC	$12.00	Faculty, Staff, Graduate Students	One-time fee	One 5.25" or one 3.5"; bring own	Yes
CSLG					
There are over 250 individual software products included in this package.	$250.00	Departments with Digital hardware	One-time fee	Call 978-4595.	No
IMSL					
UNIX Class IVA machines; FORTRAN Subroutines IMSL (MATH, STAT, SFUN): Exponent Graphics: C BASE Library: Interactive Document Facility: Environmental Install. & Assurance Tests: Registration Fee:	 $935.00 $475.00 $445.00 $140.00 $140.00 $588.00	U of T-owned machines	One-time fee	Tape cartridge or network download	Yes

***Documentation available at UTCS**

Site Licences at UTCS *cont.*

Product/ Operating System	Cost	Restrictions	Licence Period	Diskettes/ Distribution	*
IMSL					
UNIX Class IVB machines; FORTRAN Subroutines		U of T-owned machines	One-time fee	Tape cartridge or network download	Yes
IMSL (MATH, STAT, SFUN):	$565.00				
Exponent Graphics:	$285.00				
C BASE Library:	$265.00				
Interactive Document Facility:	$87.00				
Environmental Install. & Assurance Tests:	$87.00				
Registration Fee:	$588.00				
IMSL					
PC; FORTRAN Subroutines		U of T-owned machines	One-time fee	Deposit $100; borrow and return diskettes	Yes
IMSL (MATH, STAT, SFUN):	$195.00				
Maple (single machine or network server)					
DecStation 2100, 3100 (Ultrix)	$300.00	Staff	One-time fee	Borrow and return diskettes, tape cartridge; network download	Yes
DecStation 5000, 5100 (Ultrix)	$500.00				
DecStation 5400, 5800 (Ultrix)	$760.00				
HP 9000/300, HP 9000, 400 (HP-UX 7.0)	$300.00				
HP 9000/700, HP 9000, 800 (HP-UX 7.0)	$430.00				
SUN 3 (SUN OS 4.0)	$240.00				
SUN 4, SPARCstation (SUN OS 4.0)	$300.00				
SGI Personal IRIS (Irix)	$300.00				
SGI Professional IRIS 50-80GT (Irix)	$500.00				
SGI Professional IRIS 120-240GT (Irix)	$760.00				
PC-386 (DOS; UNIX)	$200.00				
MIPS, RC3230 (UNIX)	$300.00				
IBM RS6000 model 320 (AIX)	$300.00				
Macintosh (Finder)	$130.00				
Note: station cost is half the single machine price.					

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Site Licences at UTCS *cont.*

Product/ Operating System	Cost	Restrictions	Licence Period	Diskettes/ Distribution	*
Novell Netware 3.11 — 20-user Licence					
PC; LAN Server Licence: Upgrade Licence: Upgrade from Other Vendor's Software: Mac Netware 3.0:	 $2400.00 $1335.00 $2000.00 $400.00	University Departments	One-time fee	Deposit $50; borrow and return diskettes	Yes
Novell Netware 3.11 — 100-user Licence					
PC; LAN Server Licence: Upgrade Licence: Upgrade from Other Vendor's Software: Mac Netware 3.0:	 $4670.00 $2000.00 $3336.00 $400.00	University Departments	One-time fee	Deposit $50; borrow and return diskettes	Yes
ProComm					
PC; Communications Note: Documentation on disk; part of package	Free	Faculty, Staff, Graduate Students, Undergraduate	N/A	Two 5.25"; bring own	Yes
QuickMail					
Mac; Electronic mail Per user: Upgrades:	 $35.00 $17.00	Faculty, Staff	One-time fee	One 3.5"; bring own	No

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Site Licences at UTCS *cont.*

Product/ Operating System	Cost	Restrictions	Licence Period	Diskettes/ Distribution	*
SAS/PC					
PC; Statistical analysis BASE/STAT/GRAPH/FSP: IML module: ETS module:	 $35.00 $22.00 $35.00	Faculty, Staff, Graduate Students, Undergraduate	July 1- June 30	Deposit per binder (Maximum $100); borrow and return diskettes	Yes
SAS/PC network					
PC; Statistical analysis Per station:	 $17.00	Faculty, Staff, Graduate Students	July 1- June 30	Deposit per binder (Maximum $100); borrow and return diskettes	Yes
SAS/UNIX (Sun 3)					
UNIX; Statistical analysis BASE/STAT/GRAPH: FSP, IML modules:	 $198.00 ea. $70.00	Faculty, Staff, Graduate Students	July 1- June 30	Tape cartridge	Yes
SAS/UNIX (Sun 4)					
UNIX; Statistical analysis BASE/STAT/GRAPH: FSP module:	 $264.00 ea. $92.00	Faculty, Staff, Graduate Students	July 1- June 30	Tape cartridge	Yes
SPSS/PC					
PC; Statistical analysis FullPackage: Data Entry Module Only:	 $40.00 $20.00	Research	Nov 1- Oct 31	Deposit max. $50; borrow and return diskettes	No
SPSS/PC network					
PC; Statistical analysis FullPackage: Data Entry Module Only:	 $20.00 per station, plus server $10.00 per station, plus server	Research	Nov 1- Oct 31	Deposit max. $50; borrow and return diskettes	No

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Site Licences at UTCS *cont.*

Product/ Operating System	Cost	Restrictions	Licence Period	Diskettes/ Distribution	*
SYSTAT					
Mac; Statistical analysis	$58.00	Faculty, Staff, Graduate Students	July 1- June 30	Six 800KB 3.5" diskettes; bring own	Yes
SYSTAT network					
Mac; Statistical analysis Price per station, plus server:	$29.00	Faculty, Staff, Graduate Students	July 1- June 30	Six 800KB 3.5" diskettes; bring own	Yes
UNIX V, Release 4					
Operating System	$18.00	Faculty, Staff, Research	One-time fee	*Send electronic mail to molnar@gpu.utcs.utoronto.ca*	No
WATFOR-77					
PC; FORTRAN compiler [$35 WATFOR-87 (math co-processor)] GKS (Graphics Kernal System)	$35.00 Add $5.00	Research	July 1- June 30	Two-three 5.25" diskettes; bring own	Yes
WordPerfect (individual & networked machines)					
PC; WordProcessing New, per machine: Upgrade, per machine:	$42.00 $15.00	Faculty, Staff	One-time fee	Deposit $25; borrow and return diskettes	Yes

***Documentation available at UTCS**

PC Maintenance

Below is a listing of microcomputer equipment which UTCS Field Service covers under yearly maintenance contracts. All contracts are based on a minimum 12 month period. Service calls are handled on a first-come, first-served basis. Average response time is four hours. Equipment must be certified as operational prior to commencement of a maintenance contract. (There is no extra charge for this service.) Please contact UTCS Field Service at 978-5050 or 978-6486 to obtain service and pricing information.

IBM PC or Compatible Equipment

Systems
IBM PC or Compatible
IBM PC/XT or Compatible
IBM PC/AT or Compatible
IBM PS/2 - Model 25
IBM PS/2 - Model 30
IBM PS/2 - Model 50

Disk Drives
360KB & 1.2MB 5.25-inch Floppy
720KB & 1.4MB 3.5-inch Floppy

Hard Disk Drives
20,30,40,60 & 80 Megabyte

Displays
Monochrome
CGA / EGA / VGA Colour
PS/2 Monochrome
PS/2 Colour Display

Modems
1200 & 2400 baud

Laser Printers
HP LaserJet
HP LaserJet II
PS Jet +
QMS PS 800
QMS PS 800+
QMS 810

Dot Matrix Printers
C-ITOH F10-40 & F10-55
Epson RX80, FX80 & FX100
Epson LQ800, LQ1000, LQ1500
IBM Proprinter & Proprinter XL
NEC 3550, P5 & P6
Panasonic KX-P1091 & KX-P1092
Roland PR-1012
Toshiba P340, P341, P350 & P1351

Apple Macintosh Equipment

Systems
Mac 128, 512, Plus
Mac Classic - All Models
Mac LC - All Models
Mac SE - All Models
Mac SE/30 - All Models
Mac II, IIx, IIcx, IIci, IIsi, IIfx

Disk Drives
400KB, 800KB 3.5-inch Floppy
1.4MB 3.5-inch Floppy

Hard Disk Drives
20,30,40,60 & 80 Megabyte

Displays
Apple Mac 12-inch Monochrome
Apple Mac 12-inch RGB
Apple High-Res 12-inch Monochrome
Apple High-Res 13-inch Colour

Modems
1200 & 2400 baud

Laser Printers
Personal LaserWriter LS
Personal LaserWriter NT
LaserWriter
LaserWriter Plus
LaserWriter IINT
LaserWriter IINTX

Dot Matrix Printers
ImageWriter I
ImageWriter II
ImageWriter II/L
Apple StyleWriter

Support for UNIX

We support timesharing on GP UNIX under Sun OS 4.1.1.

Support for VM/CMS

We support CMS release 6.0 under CP/HPO releave 6.0 For CMS support, call Supervisor Ted Sikorski at 978-6602.

Support by UTCS Advising

The following are microcomputer software packages supported by the UTCS Advising and Consulting Group. This service is available to University of Toronto faculty, staff, and graduate students. For assistance with the products listed below, call 978-HELP, Monday through Friday, between 12:00 noon and 6:00 p.m.

Package/Compiler	Version	Environment
Communications		
File Transfer & Terminal Emulators		
MacKermit	0.9(40)	Macintosh
ProComm	TU 2.4.2	MS-DOS
Database Managers		
dBASE IV	1.1	MS-DOS
FoxBASE Mac	2.01	Macintosh
Electronic Mail		
QuickMail	2.2.3	Macintosh
Operating Systems		
IBM PC & Compatibles		
IBM PC-DOS	4.0	n/a
Microsoft MS-DOS (incl. IBM PC-DOS)	3.3	n/a
Macintosh		
Finder	6.0.X	n/a
MultiFinder	6.0.X	n/a
System	6.0.X	n/a
Spreadsheet & Charting		
Lotus 1-2-3	2.02	MS-DOS
Microsoft Excel	2.2a, 3.0	Macintosh
Statistical		
SAS/PC	6.04	MS-DOS
SPSS/PC+	4.0	MS-DOS
SYSTAT	3.2, 5.1	Macintosh
SAS	5.18, 6.07*	VM/CMS
SPSS^{x}	3.1, 4.1	VM/CMS
SAS	6.03, 6.07	UNIX, Sun3, Sun4
Word Processing		
Microsoft Word	4.0	Macintosh
WordPerfect	5.1	MS-DOS

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